EFFECT OF TWO PRACTICE SCENARIOS ON SONG MEMORIZATION ACCURACY

BY

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Abstract

This study examined song memorization sequences using memorization accuracy scores. Vocal performers (*N*=42) were split into two groups. The participants in Group A were first asked to memorize only the text of a song in both non-rhythmic and rhythmic forms, then were asked to memorize only the melody of a song. The participants in Group B were first asked to memorize only the melody of a song, then to memorize only the text of a song in both non-rhythmic and rhythmic forms. Both groups were allowed to hear the whole song performed with words and melody before their memorization tasks and were allowed a short period of time to practice the whole song after their other memorization tasks. Participant scores on a final test of memorization reflected accuracy in text, intervals, and rhythms. Results indicated no significant difference in overall test scores according to memorization sequence. However, graduate students scored significantly higher than undergraduate students, and students with four or more years of piano study scored significantly higher than students with fewer than four years of piano study.

Results were discussed in terms of memorization strategies for texted music, performance scoring methodologies, and suggestions for future research.

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Chapter 1

Introduction

Thomas Beecham said, "Great music is that which penetrates the ear with facility and leaves the memory with difficulty. Magical music never leaves the memory" (Music, n.d.). In some areas of music, it is either a requirement or a tradition to make sure that music never leaves the memory. If not never, at least it stays in the memory until performances are completed.

Opera singers are required to perform staged movements during performances. They cannot practically hold a score during some movements and must therefore memorize it. These singers are concurrently acting out stories that are happening in real time. Believing these stories would be more difficult if the actors were reading from musical scores. For these reasons, opera singers must memorize their music.

Many organizations and schools require repertoire to be memorized. The Indiana University South Bend School of the Arts audition requirements, for instance, specify that voice auditions, "must be memorized" (The Trustees of Indiana University, 2012). Likewise, the Wisconsin National Association for the Teachers of Singing (NATS) competition requirements specify, "All repertoire must be sung from memory except for oratorio, mass, or cantata arias" (Wisconsin NATS – National Association of Teachers of Singing, 2011).

Many choral directors have their choirs perform music from memory. The Idaho Music Educators Association (2011), for example, specifies that choirs must perform from memory in large group choral competitions. On this point, Corbell (2009) comments, "it just looks more polished and professional when you don't have … the

majority of the choir glued to the sheet music instead of the director" ("Darrell Corbel on April 22," para. 1).

As Robert Louis Stevenson says, however, "I've a grand memory for forgetting." Memorizing takes work. Understanding how memories develop could aid the processes one uses to memorize scored music.

In 1968, Atkinson and Shiffrin proposed a multi-store model of how memory works. This model includes the sensory memory store, the short-term memory store, and the long-term memory store (Abbott, 2009). First, information is presented to the senses. This information, such as something seen or heard, stays in the sensory memory for about .5 to 1.0 seconds. If this information is given attention, the short-term memory stores the information. The information shows itself as neural patterns of the brain while being attended. The information is stored in the short-term memory for approximately 18 to 20 seconds (Abbott, 2009) or no more than 30 seconds (Lynch, 2011). If information from the short-term memory is sufficiently processed, it can be transferred to the long-term memory. Information in long-term memory can be stored for an indefinite amount of time (Abbott, 2009; Lynch, 2011).

Memories are stabilized when synapses are strengthened through a process called consolidation (Memory, n.d.). Duke (2006) states,

> When the rate of improvement in an initial learning session begins to slow and asymptotic levels of performance improvement are reached, the consolidation process begins (Hauptmann & Karni, 2002; Hauptmann, Reinhart, Brandt, & Karni, 2005; Ofen-Noy, Dudai, & Karni, 2003), continuing for up to 6 waking hours following the termination of practice. (p. 113)

The practice that Duke mentions could apply to many activities, including music. Musicians who practice the same material nearly every day would therefore develop very stable memories for the material.

To memorize music most easily, musicians need to practice efficiently. Practice that is distributed over a period of time has been shown to be more effective than practice that is all in one period (Deutsch, 1999). When practicing with the intent of memorization, analyzing the score is more effective than not analyzing the score (Ross, 1964). Various researchers have observed musicians using particular techniques to memorize scores. These techniques include (a) musical analysis; (b) fragmenting, chunking, or segmenting sections of music for practice; and (c) alternating tempi of a repeated section of music during practice (Deutsch, 1999; Ginsborg, 2004; Mishra, 2010).

While there appear to be many individual practice and memorization techniques available, what the techniques have in common is that they are planned and possibly executed by the musician. When a practice period is planned, the musician has thought about this period of time. This practice planning and execution has been labeled variously as metacognition, cognition, or motivation, but, regardless of nomenclature, observers have viewed it as one of the most important and most used elements of effective practice for memorization among students and experts (Ginsborg, 2004; Mishra, 2010; Nielsen, 2004).

In an online post headed, “To memorize or not to memorize?," Martins (2009) asked fellow choir directors not only whether or not they had their choirs memorize their scores, but also how they went about having their choirs memorize (“To memorize or not

to memorize?," para. 1). By so doing, Martins indicated at least implicit recognition that memorization efficiency can be a consideration of whether to memorize or not.

To date, comparatively few investigations have focused explicitly on vocalists, who must memorize text as well as music. In a review of 106 years of articles on memorization, Mishra (2010) found that only 3% of the articles discussed memorization of vocal music. Among these studies, some have compared memorization efficiency of musicians to non-musicians (Mito, 2004) and some have compared memorization techniques and abilities of different levels of singers (Ginsborg, 2002; Ginsborg, 2004).

Ginsborg (2004) focused on singers according to their status as expert, amateur, and student singers. In a pilot interview, she asked five professional singers about their memorization strategies. From the responses, Ginsborg presented a 3-step process to memorization: (a) "initial study"; (b) "learning"; and (c) "deliberate, rather than implicit, memorization" (p. 150). Although Ginsborg found that the best memorizers started early and used metacognitive skills, she neglected to report the specific experience level (student, amateur, or professional singer) of the best memorizers. She states, nonetheless, that these best memorizers "reported learning the words and music of songs separately before combining them. Their memorization strategies were primarily for words rather than the music" (p. 150). This primary attention to words, according to Ginsborg, included, but was not limited to foreign languages.

Other sources endorse this basic strategy of concentrating first on text and then on melody. For instance, Chris Foley, a vocal coach, recommends that singers "memorize the text away from the music" (Foley, 2007). Likewise, in the blog "Singing Like Pro", the blog author proposes five steps to effective memorization of a song. These steps are

(a) read the lyrics, (b) speak out the words of the song, (c) listen to the melody, (d) whisper the words, and (e) sing the words and the melody together (5 steps, n.d.). The author of this blog offers no obvious documentation of the effectiveness of these five steps, nor any reason why the reader might consider them credible. However, similarly to Foley (2007) and Ginsborg (2004), the author recommends attending to the text before the melody, and, in agreement with Ginsborg (2004), suggests putting words and melody together as the final step of the practice sequence.

In an article from the *Journal of Singing*, Gregg (2000) recommends that singers first memorize the poetry of a song, and then connect the text to the rhythms that the composer gave it. She states that only "after the articulation and rhythm have been conquered, the next step is adding the melody line to the memorization process" (p. 55).

Purpose Statement

Given both the paucity of research to date on memorization of texted music and professional advice that suggests addressing text before melody is appropriate, the purpose of this study was to determine the potential effects of two practice scenarios (text-melody sequence and melody-text sequence) on memorization accuracy test scores of vocal performers ($N = 42$) tasked with memorizing the same song in a consistent time frame.

Research Questions

To that end, the following research questions guided this investigation:

1. Are there significant differences in participants' memorization accuracy scores according to whether they practice the melody first or the text first?

2. Are there significant differences in memorization accuracy scores according to the demographic variables of experience, sex, and post-secondary education level?
3. How do participants describe the way they typically memorize a song?

Definitions

The following are definitions of major terms employed in this study:

Short-Term Memory

The up to 20-second storage of information in the brain by means of neural firing patterns according to Atkinson and Shiffrin's multi-store model of memory (Abbott, 2009).

Long-Term Memory

The indefinite storage of information in the brain by means of altered brain wiring patterns according to Atkinson and Shiffrin's multi-store model of memory (Abbott, 2009).

Memory Recall

Retrieving previously gathered information from the memory store.

Memorization

Encoding of information in the brain in the short-term or long-term memory.

Interval Accuracy

Performing an interval between two pitches that is equivalent to the notated interval. Assessed based on human evaluator's best judgment.

Rhythmic Accuracy

Beginning and ending a sound close to the note length notated. Accuracy is assessed based on human evaluator's best judgment.

Text Accuracy

The text is considered accurate to the degree its individual words are enunciated to the level where listeners can identify them as the words of the song verbatim and in the proper order. This accuracy is assessed according to the human evaluator's best judgment.

Chapter 2

Review of Literature

This chapter presents a review of literature related to memorization of texted vocal music in terms of the following categories: (a) general practice methods, (b) musicians and non-musicians, (c) memory during sleep, (d) improving memorization, (e) text recall, (f) melody and text integration, and (g) vocal memorization strategies.

Practice

A number of studies have been completed on music practice techniques and efficiency. Nielsen (2004) surveyed 130 first-year advanced music students about learning and study strategies during individual practice. *The Motivated Strategies for Learning Questionnaire* (The MSLQ-inventory) was adapted for use with Norwegian speakers and was used as the survey assessment of participants. Nielsen found that the music students used cognitive and metacognitive strategies more prominently than using strategies to manage their resources such as help seeking, peer learning, and time and study environment control.

In another study, Byo and Cassidy (2008) gathered survey and observation data on undergraduate instrumental music education majors. In the survey data, 38 respondents provided information that included common practice techniques. These techniques included slowing down the tempo, changing something in the performance, isolating a problem, using a different sound source, using a metronome, repeating a section, analyzing the music, memorizing the music, recording one's self, playing long-tones, and performing scale studies. The authors completed an observational study of nine of these instrumentalists. They found that the participants did, in fact, use many of

these practice methods, but many participants did so in an inefficient manner. The authors stated that there were inconsistencies between "knowing" and "intelligent doing" in the participants in the study.

Musicians and Non-Musicians

Research has been done comparing the skills of musicians and non-musicians. A study by Mito (2004) compared Japanese musicians' and non-musicians' memorization skills. There were twenty-one participants split into three groups. The three groupings were based on a preliminary survey and consisted of: (a) a pop-immersed non-musician group, (b) a pop-immersed musician group, and (c) a non-pop-immersed musician group. The participants were given four ten-minute practice sessions to learn and memorize a popular Japanese song. They were provided with a lyric sheet and a CD of the pop song and allowed to practice in their own way. After each practice session, the rhythm and pitches of the melody and the syllables of the words were assessed. Mito found that the non-musicians had a higher level of correct melody recall than the non-immersed musicians after each of the four practice sessions and higher than the pop-immersed musicians after the first practice session. The non-musicians had a higher level of correct syllable recall than both the non-immersed and immersed musicians after all four of the practice sessions.

Memory During Sleep

Time and sleep have been shown to have an effect on memory. Duke (2006) researched memory consolidation and its connection to sleep. In his experiment, non-music majors ($N = 49$) were asked to repeat tapping sequences on an electric keyboard in training and retest sessions. Two sequences were used, Sequence A and Sequence B.

The author measured the number of correct keys played per 30-second block (CKP/B). Approximately 24 hours separated each training and retest session. The participants were divided into five groups and given different schedules of training and retesting. The five groups included Group A24a, Group AB24ab, Group AB24ab, Group A24B24ab, and Group A24aB24ab. This group nomenclature was set up as A and B representing presentation of Sequence A or Sequence B, a and b representing testing of Sequence A or Sequence B, and 24 representing a period of 24 hours rest which included sleep.

There was no relationship found between CKP/B and reported amount of sleep or sleepiness. There was also no relationship between improvement between sessions and amount of sleep or sleepiness. Duke did find that all groups experienced sleep-dependent improvements between presentation days and test days. However, Group A24aB24ab experienced a unique result. For this group, Sequence A showed sleep-dependent improvements over the 24-hour period. Sequence B was presented immediately after testing Sequence A on day two. When both sequences were tested on day three, Sequence B showed sleep-dependent improvements, but Sequence A did not. Duke stated, "these data indicate that learning the second sequence on Day 2 inhibited expected sleep-dependent enhancements in the first sequence between Day 2 and Day 3" (p. 118).

In a similar study, Cash (2009) investigated college students' (N = 36) performances of a simple keyboard sequence with periods of rest during practice as well as a night of sleep between practice and retesting. Practice of the sequence was completed in thirty-second blocks alternated with thirty seconds of rest. Cash grouped these blocks into triplets (one, two, and three; four, five, and six, etc.), with blocks 1 - 12 on the first day. The researcher retested blocks one through six on the following day.

These participants were split into 3 groups. The first group was an early rest group, which had a period of 5 minutes of rest between blocks 3 and 4 instead of the typical thirty seconds. The second group was a late rest group, which had a period of 5 minutes of rest between blocks 9 and 10 instead of the typical thirty seconds. The third group had no periods of extended rest during the first day of practice. Following sleep, on the second day, all 3 groups were given the typical thirty seconds of rest between the blocks as well as a 5-minute period of extended rest between blocks 3 and 4.

In analyzing the triplet blocks, Cash (2009) found that the greatest increase in performance occurred between blocks 3 and 4 for all 3 of the groups. The early rest group had a greater amount of increase in performance skill than the late rest or no rest groups during this interval. The late rest group had a higher increase in performance than the other groups between blocks 9 and 10. Cash found that the increase in performance during rest periods was greater if the rest was placed earlier in the practice period than if it was placed later in the rest period.

Moreover, the night of sleep produced an increase in performance skill. This increase was greater for the early rest and no rest groups than for the late rest group. When Cash compared the performance of the first triplet block of the late rest group to the group's triplet block before the extended rest, she found that the improvement was similar to a night of sleep. The author proposed that late extended rest during practice could be seen as an indicator of performance gain.

Improving Memorization

Memorization has been studied and written about for centuries. Mishra (2010) compared pieces of literature ($N = 185$) on music memorization from 1872 to 2006. She

found a number of repeating trends. One large trend was that cognitive analysis aids memorization. She writes that mindless repetition could result in an unstable level of memorization. Many commentaries state that formal or informal analysis help memorize music. Mishra found that through all of the literature, the primary focus was on the most effective ways to encode musical memories. Guided analysis, feedback importance, and memorization methods were among the ways studied.

Ross (1964) investigated the effect of guided analysis on memorization in woodwind performers ($N = 20$). The woodwind performers were matched on the basis of a combination of pretest memorization trials and freshman entrance examination scores. They were then placed into a control group and an experimental group. After the experimental group received weekly training in guided analysis for six weeks, their mean memorization trials dropped 8.8 trials between the pretest and posttest. This drop was statistically significant. The control group received no training and experienced no change in number of memorization trials between pretest and posttest. The guided analysis strategy, which addressed tonal relationships, use of imitation, important intervals, repetition of motives and phrases, and rhythmic patterns, was determined to be valuable to the participants in this experiment.

Highben (2004) tested practice conditions for pianists ($N = 16$) with different feedback scenarios. Four conditions were studied. The first was a normal condition with motor feedback on the keyboard and auditory feedback of notes played. The second was a motor only condition without auditory feedback. The third was an auditory only condition with hands kept in loose fists (no motor feedback) and a computer-generated recording played. The fourth was a covert practice condition in which the participants

imagined feedback, but held their hands in loose fists and heard silence (no motor or auditory feedback).

After testing memory of pieces learned in these practice scenarios, Highben found that the normal conditions had the least errors, while the covert practice had the most errors. The covert practice was significantly worse than any other condition. The normal condition was significantly better than the motor only condition and the covert practice condition. The normal condition was not significantly better than the auditory only condition. Highben found that the feedback tested aided in the recall of music during the tests.

In a study of piano memorization method efficiency, Rubin-Rabson (1939) divided 36 piano players into four groups. All groups were first given time to study piano excerpts without a piano, then they learned the excerpts by repeating them on the piano as many times as necessary until memorized. The first group had uninterrupted study, then learned both hands together in learning trials. The second group had uninterrupted study, then learned hands separately followed by both hands together in learning trials. The third group had study interrupted by three keyboard trials of both hands together, then learned both hands together in learning trials. The fourth group had study interrupted by a trial for each separate hand and a trial of both hands together, then learned hands separately followed by both hands together in learning trials.

Two weeks after this procedure, all groups relearned the excerpts using trials of both hands together. To gauge the quality of memorization, the participants were then asked to play each hand separately and transcribe the piece from memory. Results

indicated no notable difference in the number of trials necessary for memorization between the four groups.

Rubin-Rabson also found that the number of trials necessary for memorization was remarkably similar for the groups that learned hands combined, whether preceded by interrupted or uninterrupted study as well as a remarkably similar number of trials necessary for memorization for the groups that learned hand separately, whether preceded by interrupted or uninterrupted study. The trials necessary for relearning were also very similar for all four of the groups. In gauging the quality of memorization, the groups that learned the excerpts as separate hands performed better than those that only learned the excerpts with both hands.

Text Recall

Many studies have been completed on the topic of text recall both within and outside of music. Noice and Noice (1996) observed methods of memorizing a theatrical script. They compared methods used by professional actors (n = 6) and methods used by a mnemonist (n = 1), who memorizes long lists of data for entertainment. The participants were asked to prepare a script as if they were to perform it in the future. The actors used many strategies of study. The actors' primary strategy was looking at the mental and emotional interactions between the characters. The other strategies used by the actors varied by participants.

The mnemonist only used one strategy. That strategy was to visualize and link the words in the script. Noice and Noice observed that the actors were concerned with the details of the characters and the story while the mnemonist was only concerned with the verbatim recall of the words. Noice and Noice wrote that “Lorayne [the mnemonist]

appeared to look at the script from the outside, as information to be remembered; the actors appeared to look at it from the inside as a life to be lived" (p. 11). Both methods, according to the researchers, have been working in the professional lives of the participants.

Some texts that have been memorized remain in the memory for very long periods of time. Rubin (1977) set up four experiments to study very long-term memory for well-known texts. In the first experiment, he asked 92 undergraduates to write what they could remember from texts that are typically taught to American children. Because of the aspect of very long-term recall, no control was present in learning the text or practice or retention interval of the text. The texts used were "The Preamble to the Constitution," "The 23rd Psalm: A Psalm of David," and "Hamlet's Soliloquy."

Not all participants could recall these texts. Of those that could remember sections of the texts, Rubin found that the sections recalled were "among the most regular in cognitive psychology" (p. 611). In other words, if a participant made errors in recall, the errors were in similar locations of the text to where other participants made errors. When text was recalled, participants generally recalled the text verbatim. Rubin found that errors in words were only made in 15% of words recalled. He compared this finding to recall in laboratory conditions in a different study that showed a 69% error per words recalled.

In the second experiment, Rubin gathered data from 51 fifth grade students and 43 sixth grade students completing the same recall activity for "The Preamble to the Constitution" and Lincoln's "Gettysburg Address." The fifth graders had learned about these passages approximately six months before the experiment. The sixth graders had

learned about them approximately eighteen months before the experiment. This group represented a shorter retention time than in the first experiment. The fifth and sixth graders had similar results to the data from the adults in both specific words recalled and exact wording when recalling.

In the third and fourth experiments, Rubin (1977) introduced prompts. Lincoln's "Gettysburg Address" was the text used in the third experiment. Twenty-six undergraduates wrote as much of the text as they could on either a blank sheet of paper, a sheet that provided occasional prompting words from the text, or a sheet that provided both occasional prompting words and the first letter of each of the words. In the fourth experiment, 95 undergraduates recalled the words to "The Star Spangled Banner." The three conditions used were no music in the background, the correct music of "The Star Spangled Banner" repeating in the background, or incorrect music of "Stars and Stripes Forever" repeating in the background. In both the third and fourth experiments, texts were used that had rhythmic components. The written word prompt increased word recall and the combination of word and letter prompt increased recall even more. The participants in the correct music condition recalled more words than the participants in the no music and wrong music conditions. Location of correct words recalled was less predictable in the rhythmical texts tested in the third and fourth experiments than in the other texts observed in earlier experiments. When prompts were introduced, regularity of the location of correct words decreased as compared to no prompts.

Historically, it has been common to teach texts or other spoken patterns using music as a mnemonic device. A typical example of this has been teaching the alphabet along with the melody of "Twinkle, Twinkle, Little Star." In a study to test the value of

music as a mnemonic device, Rainey and Larsen (2002) set up two experiments. In the first experiment, they assembled two lists of names from the 1948 World Series to act as unconnected text. Seventy-nine participants were provided with audio of these lists in either a sung or spoken format. The sung version was to the tune of "Pop Goes the Weasel." The participants listened to the audio as many times as necessary until they could accurately repeat the list to the experimenters without using the audio. A computer screen showed the names written out for the first two practice trials to ensure accuracy, then was left blank for the remaining practice trials. The number of trials necessary to accomplish an accurate level of memorization was recorded. One week later, participants' long-term memory was tested in the same manner. If they could not accurately repeat the names, they began practice trials again until they could accurately repeat the names. Following the accurate performance in the second week, the participants used the same method to learn the second list of names. In the first experiment, there was no difference between the sung and the spoken condition in initial learning (Rainey & Larsen, 2002).

However, a week later, the participants who learned the list using the sung audio relearned the list with significantly fewer practice trials than the participants using the spoken audio. One participant in each group recalled the list perfectly without having to relearn it. After testing long-term memory, there was still no difference in initial learning of the second list between the two conditions.

For the second experiment, Rainey and Larsen (2002) created a list of nonsense names. This list was recorded in a spoken version and a sung version to the tune of "Yankee Doodle." One hundred and two participants were divided into three groups.

These groups consisted of a spoken condition, a sung condition, and a visual condition group. The visual condition presented the names on the computer screen, but did not present any audio material. For this second experiment, the sung and spoken conditions did not provide any initial visual component, as the first experiment did. As with the first experiment, the number of practice trials was recorded until the participants were able to accurately recite the list. To test long-term memory, participants returned one week later.

In the second experiment, Rainey and Larsen (2002) found that the group with visual conditions required significantly fewer practice trials to initially learn the list than both the spoken and sung conditions. There was no difference between initial learning in the spoken and sung conditions. The second week, the group with sung conditions required significantly fewer practice trials to relearn the list than the spoken condition. There was no significant difference in number of trials to relearn the list between the visual condition and the other groups. In this long-term memory component, 11 participants in the sung condition, four in the spoken condition, and four in the visual condition all repeated the list perfectly without having to relearn it.

In addition to memorizing text while using music as a mnemonic device, text has also needed to be recalled when sung in the context of a memorized song. Wallace and Rubin (1988) studied recall of text in the ballad tradition. They compared the performance of five different ballad singers singing "The Wreck of the Old 97." The singers each had a different version of the text and notes of the song, but the authors found that the performances were also constrained by certain elements of the ballad tradition. The researchers devised three experiments with undergraduate students to investigate some of these elements further.

In the first experiment, 27 students listened to a recording of the ballad and were asked to recall the text. Results indicated greater recall of lines in the ballad that had higher imagery in the text than lines with lower imagery in the text. Also, lines with strong metrical agreement and greater causal connectedness had higher recall among the participants than the text lines with less of these elements.

In the second experiment, Wallace and Rubin (1988) removed the poetic elements from the ballad text. These poetic elements involved assonance, alliteration, and rhyme. However, end rhyme between lines and meaning of text were both maintained. A new recording was made with this text that 27 students from the same population as in the first experiment listened to and attempted to recall. Results from this second experiment indicated greater recall with the original version of the text with poetic elements than with the altered version. Also, when the poetic elements were removed and errors occurred, there was greater variability among these errors than in the errors occurring in the original version.

In the third experiment, Wallace and Rubin (1988) altered rhythmical elements of the original ballad text. They asked 87 students to listen to and recall either a tape of the text spoken with normal voice intonation, spoken with the stressed words emphasized, or spoken with the stressed words emphasized and with a beat playing in the background. Findings indicated that for the two conditions with rhythmic elements emphasized participants recalled more text than they did with the condition with normal speech intonation.

In a later four-part study to expand further on the spoken, rhythmic, and melodic elements of text recall, Wallace (1994) tested recall of text while musical aspects were

present or not. In experiment one, she had 64 participants listen to a three-verse ballad that was either sung or spoken. The participants then recalled the text in writing. In experiment two, 21 participants listened to the three verses as read rhythmically with a metronome beating in the background. They then recalled the text, which was compared to the sung conditions of experiment one. In experiment three, 39 participants listened to sung and spoken versions of only verse one of the ballad. Wallace found that in both experiment one and two, the verbatim word recall was significantly higher in the sung conditions than in the spoken or rhythmically spoken conditions. However, in experiment three, the recall was significantly higher in the spoken condition than in the sung condition. Differentiating between the three-verse conditions and the one-verse conditions, Wallace (1994) concluded, "for a single verse, music appeared to disrupt more than to facilitate learning and recall of the text" (p. 1477).

To further investigate the difference in text recall with differing melodic lengths, Wallace (1994) set up a fourth experiment. In this experiment, 48 participants heard a new three-verse ballad under three conditions. The first condition was spoken, the second was sung to the same melody for all three verses, and the third was sung to an altered melody for each of the three verses. Wallace put this ballad together using material from *The Frank C. Brown Collection of North Carolina Folklore* (White, 1952; 1957). In Wallace's fourth experiment, she found that verbatim text recall was greater for the single melody repeated over all three verses than for either of the other two conditions. There was little difference between recall in the spoken and three melody conditions.

Melody and Text Integration

Some researchers have been interested in a possible integration between melody and text in memory when both have been recalled simultaneously. In a study of melody and text integration, Serafine and Crowder (1984) conducted two experiments using folksongs. Thirty-two participants listened to folksongs presented initially and then were quizzed to identify aspects of those songs. The researchers created songs to test the recognition of old words and old tunes from the initial presentation. These quiz songs included old songs that were unchanged, new tunes with new words, old tunes with new words, new tunes with old words, and old tunes with mismatched old words. Participants were able to correctly identify old songs as old songs much more frequently than any of the new song scenarios. Individual elements of the old songs were identified more accurately when the tune and words were matched as they were initially presented rather than being matched with any other element.

In their second experiment, Serafine and Crowder (1984) had 48 participants listen to folksongs initially presented and then quizzed for memory. This strategy was similar to their first experiment, however, they added to the recording and added to the participant instructions. In the instructions, in addition to telling some of the participants to listen and that their memory would be tested, they also told some of the participants to listen to only the melody, for only it would be tested. For the recording, the researchers added a female recording to the male recording from experiment one. They found that old tunes were identified more accurately when paired with original old text than when paired with mismatched text for both conditions of different instructions and different recordings. This result was similar to the findings from the first experiment. They also found that participants showed an integration effect when asked about the words of the

song. Old tunes were identified more frequently when old words were being presented. This identification was not always an accurate identification and happened in both sets of instructions.

Crowder, Serafine, and Repp (1990) investigated the integration of words and melodies in song even further by testing two hypotheses. These hypotheses were the "physical interaction" hypothesis and the "association-by-contiguity" hypothesis. The physical interaction hypothesis was based on the idea that the words of a song contribute specific phonetic elements that become integrated with the melody. The researchers proposed that if these phonetic elements were altered, then the song would become identified as a distinctly different song.

The association-by-contiguity hypothesis suggested that integration occurs by the melody and the text happening close to or at the same time. Crowder, Serafine, and Repp proposed that if the association-by-contiguity hypothesis is correct, then if the words and melody were presented at the same time except produced from separate sources, the listener would still identify it as a song if produced from the same source.

Three experiments were set up to test these two integration hypotheses. The researchers constructed new texts for the same folk songs they had used in past experiments. The new texts were devised based on phonetically similar consonant sounds while leaving the vowels untouched. The original folksong texts were altered to have two variations of phonetically changed nonsense texts used in the three experiments.

The first experiment was undertaken to verify that integration effect seen in past experiments could be duplicated for the nonsense texts. The authors presented songs to fifteen undergraduate students. In a test, the participants then identified which song

melodies they had already heard. The three song types that were tested were "old songs" with old melodies matched with original text, "mismatched songs" with old melodies matched with different old texts, and "new songs" with new melodies matched with old texts. "Old songs" were identified as being heard with a higher confidence rating than the "mismatched" and "new songs." Even with nonsense texts, integration between words and melodies was found.

In the second experiment, the "physical interaction" hypothesis was tested using similar conditions as in the first experiment. Thirty adults were tested. Crowder, Serafine, and Repp found that the integration effect was valid with the phonetic differences in the nonsense song as well as with identical phonetic sounds. This experiment showed that the "physical interaction" hypothesis could be an active component of word and melody integration.

In their third experiment, Crowder, Serafine, and Repp (1990) tested the "association-by-contiguity" hypothesis. They constructed a recording of divided word and melody by humming the melody, then recording spoken words on top of the melody. Twenty-four adults were presented with the divided songs, then half were tested with divided songs and half were tested with true songs. Both groups identified the "old songs" more than the "mismatched" and "new songs." This finding pointed to integration regardless of whether the recording being tested was divided songs or true songs, and supported the "association-by-contiguity" hypothesis.

Vocal Memorization Strategies

Few studies have explored memorization strategies specifically with vocal musicians. In an observational study, Ginsborg (2002) analyzed practice sessions from

13 singers of different experience levels and memorization proficiency levels. The participants all memorized a song. From these practice sessions, Ginsborg documented both the practice strategies used and which strategies were most effective in memorizing the song.

Ginsborg (2002) asked the participants to memorize the song over six 15-minute practice sessions and to record their practice sessions on their own. The participants were broken up into student, amateur, and expert categories. After analyzing memorizing speed and accuracy, they were also broken up into fast, accurate memorizer and slow, inaccurate memorizer categories. The fast, accurate memorizer group was comprised of one student, one amateur, and three experts. The slow, inaccurate memorizer group was comprised of three students, three amateurs, and two experts. The level of singing experience therefore did not equate to the level of memorizing proficiency.

Ginsborg analyzed the practice sessions by transcribing the speech on the recordings, categorizing nine modes of attempt, and defining the errors made. Ginsborg defined the nine modes of attempt, in order of prevalence in her study as "singing the words (reading from the score); singing the words (from memory); playing the melody, accompanying themselves, speaking the words aloud, vocalising, and counting aloud (reading from the score); counting aloud and speaking the words aloud (from memory)" (p. 93). Ginsborg (2002) defined errors as "errors in the words (spoken and sung), the underlay (sung) and the music (sung)" (p. 66). She analyzed the practice sessions by counting the number of beats according to the music score and the number of errors over the period of the practice sessions.

Ginsborg (2002) found that expert singers did not use more modes of attempt than less-expert singers. However, she found that the fast, accurate memorizers used more modes of attempt than the slow, inaccurate memorizers. The fast, accurate memorizers did not study the words and music separate more often than the slow, inaccurate memorizers. Ginsborg found that practicing the words and music together seemed to be the better strategy to memorize the song. One of the dominant trends in Ginsborg's results was that the fast, accurate memorizers started memorizing earlier than the slow, inaccurate memorizers.

Ginsborg's 2002 study was completed as an observational study where she sent materials to participants and allowed them to record their practice habits and send the recordings back for analysis. The author, therefore, did not have control of many elements of this study such as types of keyboards, external practice room noise, or session interruptions. The author mentioned she asked participants to record six 15-minute practice sessions. She had originally sent material to 15 participants, but two of the returned recordings were unusable. Of the 13 participants that she analyzed, only nine actually completed all six practice sessions. Two participants completed five practice sessions and two participants completed only four practice sessions. To analyze this data, Ginsborg compared the first two practice sessions from every participant as well as the final practice session from every participant. For the sessions completed between the first two and the final session, Ginsborg averaged the session data for participants to get a single session of data to compare between participants.

In another study by Ginsborg (2004), memorization strategies were both observed and tested for vocalists. The study had a pilot, an observational study, and two

experiments. In the pilot, five professional singers were interviewed about their practice and memorization methods. They reported learning words and music separately before combining them. They concentrated memorization efforts primarily on words. If words were in another language, they studied meaning and looked at phonetics. The professional singers also reported three steps in practicing: initial study, learning, and deliberate memorization.

In the observational study, Ginsborg (2004) asked 13 singers to learn and memorize a new song. These singers were both amateurs and professionals. A list of modes of attempt of memorization was created from the observations which included, "singing the words and music together, either reading from the score or singing from memory; speaking the words without the music; playing or singing the music without the words; playing or vocalizing the melody; playing the accompaniment; and counting beats aloud" (Ginsborg, 2004). The observations showed that experts were more likely to speak the words than the other groups.

In the observational study, Ginsborg (2004) also compared the best and worst memorizers. She identified the best memorizer as the participant that sang the whole song from memory earliest in the practice session and the worst memorizer as the participant who sang the whole song from memory the latest in the practice session. She found that the best memorizer sang the words of the song and the music together, started deliberately memorizing early, sang a variety of lengths of practice units, and made and implemented plans. The worst memorizer preferred to sing only the music, began memorizing later in the practice session, and sang the song in entirety.

In her observational study, Ginsborg (2004) analyzed data from the 13 participants. However, she did not give some details that could be valuable. She never described the song or criteria for choosing the song. She provided no demographic information about the participants. She did mention the modes of attempt for which she analyzed the data. These modes of attempt were similar to the modes of attempt presented in her 2002 study. They did not, however, cover all possible modes presented in the earlier study.

The observational study from Ginsborg's 2004 study seems very similar in many ways to her 2002 study. The number of participants is even the same. One key difference that is presented is in the instructions to her participants. In the 2004 study, Ginsborg asked her participants to "provide a concurrent verbal commentary" (p.152) with the recorded practicing. She does not state that she asked participants to provide this commentary in her 2002 study. The latter study does not reference the earlier study. These details of the 2004 study could make results and conclusions clearer.

In the first experiment, Ginsborg asked sixty participants to memorize a newly constructed, unaccompanied folk song. The participants were both expert and novice memorizers. They were broken into three groups. The first group memorized the words separately from the melody, then the melody separately from the words, then both the words and music together. The second group memorized the melody, then the words, then the words and melody together. The third group memorized only the words and melody together. All groups had a twenty-minute memorization session. At the end of the session, the participants were asked to perform the song, then were interviewed about

musical training and experience for ten minutes. After the interview, the participants were asked to perform the song once again.

Ginsborg found no difference in the quality of memorization between the novice and expert memorizers. However, she found that the participants that memorized words and melody together for the entire memorization session made fewer errors in remembering words than the participants that memorized words and melody separately.

Again, Ginsborg (2004) did not give complete details of her study for her first experiment. She said that she asked her participants to memorize a folk song, but did not name or describe her song or criteria for choosing the song. The participants were given 20 minutes for the memorization phase. Ginsborg did not describe how or if this time period was broken up between memorization strategies of memorizing the words, the melody, or both.

In the second experiment, Ginsborg (2004) compared text and melody integration. She asked 20 expert singers to learn two songs over two sessions. One song had semantically meaningful text and the other song had non-semantically meaningful text. The non-semantically meaningful text was digits. The texts were set to separate melodies. The participants had a memorization session of repeating the song until memorized for each of the songs. Ginsborg set up a series of tasks to test the retrieval of the text and melody separately and together. She found that the digit text took longer to memorize than the word text. However, the word text was not consistently recalled more accurately than the digit text. In terms of speed, the digit text was recalled slower than the word text in some tests. The digit texts were sung faster and more accurately when set to music than when not set to music. Ginsborg found that both texts appeared to be

encoded as text and melody together. She also found that the participants who memorized faster had a better performance on the tests and that the participants with higher memorization abilities had a better performance on the tests.

In her second experiment, Ginsborg (2004) again omitted numerous experimental details. The duration of the two sessions was not stated and the distribution between the two songs over the two sessions can only be assumed. The tasks that Ginsborg set up to test the retrieval of the text and melody were only described after discussing results. The tasks were never explicitly listed in their entirety.

Chapter 3

Methodology

The purpose of this study was to determine the potential effects of two practice scenarios (text-melody sequence and melody-text sequence) on memorization accuracy test scores of vocal performers tasked with memorizing the same song in a consistent time frame. This chapter describes the participants, procedures, and dependent measures of this investigation.

Participants

Participants ($N = 42$) for this study constituted a convenience sample recruited by word of mouth from the student population of a major university school of music. The participants were 18 to 34 years of age with a mean age of 23 years. The sample contained 14 males and 28 females. Participants were both undergraduate and graduate students with voice as their principal instrument. Majors included such disciplines as music education, music therapy, vocal performance, opera, and composition.

Song

I created a song to use for this investigation, based on the following criteria: (a) non-rhyming text, (b) semantically meaningful text, (c) a melody that was not strophic, (d) a melody that was attainable within one practice period, (e) a melody simple enough that the song could be sung a cappella, (f) no large periods of rest were included in the song where accompaniment would be necessary, and (g) the range would be suitable for different voice types. To create the song, the melody from Wallace's (1994) fourth experiment was used. She had created multiple melodic alterations to a simple ballad that was originally the ballad "Lord Bateman", from *The Frank C. Brown Collection of*

North Carolina Folklore (White, 1952, 1957). Based on experience, I determined that this melody was simple, attainable, non-strophic, and did not have any periods of rest for accompaniment. The melody was pentatonic in the key of G. The range of the melody was originally notated from D4 to E5. This range is appropriate for typical soprano and mezzo-soprano voices. The range of D3 to E4, one octave lower than the original, fits both typical bass and tenor voices. No additional notated copy of music was created for men's voices.

A separate text was selected so that the song did not include rhymes. The text selected was from the non-rhyming verses of the song "The Bramble Brier" (White, 1952). I and another graduate student in voice agreed that the selected verses were semantically meaningful. The text was then fitted to the melody. Based on experience, I made minor rhythmic alterations so the new text would feel natural with the melody. One grammatical change was made in the first verse from the original, "Her brothers says,…" to "Her brothers said,…" See Appendix A for the song score. See Appendix B for the song text alone.

Procedure

Upon completion of an Institutional Review Board (IRB) consent form, participants completed a written survey (See Appendix C). Survey items solicited demographic data, and participants' reported familiarity with the song to be memorized. Five song titles were presented with Likert-type rating scales to gauge differences in familiarity between the different songs. All participants indicated that they were not at all familiar with the song, "Lord Bateman." Two participants indicated that they were somewhat familiar with the song, "The Bramble Briar." The other 40 participants

indicated that they were not at all familiar with "The Bramble Briar." The song text was based on "The Bramble Briar." Finally, the participants described how they typically memorize a new piece of vocal literature.

The participants were divided into one of two experimental groups, Group A (text-melody) and Group B (melody-text). I assigned participants to these two groups by the chronological order in which participants appeared for the study, with the first participant assigned to Group A, the second participant assigned to Group B, the third participant assigned to Group A, etc.

After hearing a recording of the complete song once, participants were instructed to memorize the chosen song over four discrete periods within a 21-minute timeframe: (a) a text-only period, (b) a rhythmic text period, (c) a melodic period, and (d) a whole song period. For the text-only period, I asked the participants to memorize only the text of the song during a 4.5-minute period. For the rhythmic text period, I asked the participants to memorize the text with rhythms as they appeared in the song. The rhythmic text period also lasted for 4.5 minutes. For the melodic period, I asked the participants to memorize the pitches and rhythms of the song on a neutral vowel during a 9-minute period. For the whole song period, I asked the participants to memorize the whole song with text and melody over a 3-minute period.

The difference between Group A and Group B was the order of the two text periods and the melodic period. Group A was instructed to first do the text-only period, then the rhythmic text period, next the melodic period, and finally the whole song period. Group B was instructed to first do the melodic period, then the text-only period, next the

rhythmic text period, and finally the whole song period. In this manner, Group A was the text-melody sequence and Group B was the melody-text sequence of rehearsal.

The practice period durations were based on a pilot study, which was used to determine both duration of periods and length of song. On the basis of this pilot study, the duration of individual time periods was determined to be no less than 9 minutes to allow anticipated memorization of greater than 50% accuracy and no more than 10 minutes to use participants' time efficiently. The text period was sub-divided into two 4.5-minute periods in order to introduce a rhythmic aspect of the text. On the basis of the pilot study, the number of song verses was determined to be two verses for the same reasons of accuracy and efficiency.

Before each practice period, participants were given materials from the song to memorize. To memorize the text, the participants were given a typed copy of the text. To memorize the rhythmic text, the participants were given a copy of the text with un-pitched notation above the words.

To memorize the melody, the participants were given (a) a notated score, not including text; (b) a MIDI file of the melody on an iPod Nano played through external speakers; and (c) access to an electronic keyboard. The keyboard and externals speakers were both limited to a constant volume for each participant. The MIDI file was created using Finale software and played at a tempo of 120 beats per minute using the timbre of a grand piano.

To memorize the whole song, the participants were given the notated score, including text; and the MIDI file and electronic keyboard provided during the melody period. For each period, a pencil was also provided.

After the final practice period, the participants performed the song. I recorded this performance for evaluation using Audacity software.

To ensure that participants received exactly the same instructions, the author read instructions word for word from a script, which is included in Appendix D. The MP3 recording heard by all participants at the beginning of the experiment featured the researcher, who is a trained bass with professional singing experience, singing the correct words, rhythms, and pitches. The range heard on the recording was D3 to E4. The tempo of the recording was approximately 120 eighth note beats per second.

Scoring

At this writing, there is no single, widely accepted system for scoring singing accuracy. In this study, participant performances were evaluated according to interval accuracy, rhythm accuracy, and text accuracy. For interval accuracy, I awarded one point for each correct interval and then determined an interval total. There were a total of 69 intervals in the song. The interval sub-score was adjusted to a 100-point scale. If a participant began to sing a section, but then restarted the section, the first attempt was used for assessment, but the following attempts were not. If a section was skipped over and the participant moved to a new section, the new section was graded normally.

Evaluating intervals rather than exact pitches permits consideration of gradual modulations by participants. There is precedence in the literature for this approach (e.g., Cassidy, 1993; Killian, 1991). Other studies of sight singing (e.g., Boyle & Lucas, 1990; Lucas, 1994; Norris, 2003), however, have not allowed for modulations. Because sight singing exercises tend to be less lengthy than the song employed for this study, I decided to allow gradual modulations.

For rhythm accuracy, I awarded one point for each correct rhythm and then calculated a rhythm total. Of the sight singing studies reviewed for the present investigation, only Norris (2003) evaluated rhythm as part of a final score. The song used for the present study included 70 individual notes. For rhythmic assessment, I judged a rhythm to be correct or incorrect, independent of pitch, according to the note values notated in the score. Rests were not included. Allowance was made for the final note duration at the ends of verses if it was not sustained precisely for the number of counts indicated by the notion and for note values slightly shortened for breathing purposes. The rhythm sub-score was adjusted to a 100-point scale.

Similarly to assessing intervals, if multiple attempts were made, the first attempt was used for assessment, but the following attempts were not. Skips to other sections were allowed. The rhythm sub-score (0 - 70 points) was adjusted to a 100-point scale.

For text accuracy, I awarded one point for each correct word. Only verbatim words were considered correct. Substitutions, contractions, and paraphrasing were not considered correct. If multiple attempts were made, the first attempt was used for assessment, but the following attempts were not. Skips to other sections of the text were allowed.

There were 53 words in the song. The text sub-score (0 - 53 points) was then adjusted to a 100-point scale.

Each of the test sub-scores (intervals, rhythms, text) was converted to 100-point scales. To arrive at an overall test score, a total percentage was calculated using a weighted average of these three scores, with each having an equal weight.

A vocal performance graduate student, other than the author of this study, was trained in the assessment method for words, rhythms, and melody. This graduate student independently scored a randomly selected 20% of the participant recordings. I then compared his sub-test scores with mine. Sub-test scores within three points of each other were counted as agreements. Obtained reliability (agreements divided by disagreements plus agreements) was .78.

Chapter 4

Results

The purpose of this study was to determine the potential effects of two practice scenarios (text-melody sequence and melody-text sequence) on memorization accuracy test scores of vocal performers ($N = 42$) tasked with memorizing the same song in a consistent time frame. Results are presented according to the research questions posed for this investigation. A pre-determined alpha level of .05 indicated significance for all statistical tests.

Research Question One: Final Whole-Song Score Comparisons Between Text-Melody and Melody-Text Groups

The first research question asked if there would be significant differences between the final scores achieved by Group A (text-melody) and Group B (melody-text) participants. Table 1 lists the final whole-song test scores for both groups. The maximum score possible was 100 points. Scores for Group A ranged from 9 to 97 points ($M = 65$, Mdn = 68). Scores for Group B ranged from 23 to 99 points ($M = 71$, Mdn = 75). Although Group B performed slightly better than Group A, a Mann-Whitney U test (two-tailed) indicated no significant difference between whole song test scores for Group A and Group B, $z = -0.64$, $p = .52$.

Of the 42 participants in this study, 4 singers (9.52%) achieved scores of 95 points or above, while 11 singers (26.12%) achieved scores below 50 points. More Group A (text-melody) singers ($N = 7$) scored below 50 points than singers ($N = 4$) in Group B (melody-text).

Table 1

Whole-Song Test Scores in Descending Order for Group A (text-melody) and Group B (melody-text) Participants

Group A (text-melody) Scores	Group B (melody-text) Scores
97	99
96	96
93	94
91	94
91	90
90	89
87	89
84	85
84	84
79	80
68	75
67	71
52	65
50	62
49	60
39	55
38	51
36	48
35	44
21	36
9	23

Participant sub-scores. Table 2 presents by group the sub-scores of text, rhythm, and interval accuracy used to compute participants' final whole-song test scores.

Table 2

Participant Sub-Scores of Text, Rhythm (Rh), Interval (Int), and Total Scores by Group

Group A (text-melody) Scores				Group B (melody-text) Scores			
Text	Rh	Int	Total	Text	Rh	Int	Total
100	100	90	97	100	100	97	99
94	100	94	96	98	100	91	96
98	100	81	93	98	99	84	94
96	100	77	91	98	100	83	94
96	99	77	91	92	99	80	90
98	100	71	90	98	100	70	89
94	99	70	87	92	100	74	89
94	100	58	84	89	89	78	85
94	97	59	84	92	96	64	84
87	89	62	79	91	93	57	80
79	84	39	68	79	99	46	75
70	71	59	67	81	90	42	71
60	54	41	52	91	76	28	65
49	56	46	50	62	73	52	62
49	50	48	49	64	66	49	60
47	47	22	39	64	71	30	55
23	71	19	38	49	56	49	51
42	40	26	36	45	57	42	48
36	37	33	35	36	50	46	44
25	26	13	21	43	46	20	36
13	11	1	9	30	24	16	23

Mann-Whitney U (two-tailed) tests indicated no significant difference between the sub-scores for Group A and Group B for any of these sub-scores; z = -0.49, p = .62 (text), z = -0.54, p = .59 (rhythm), z = -0.64, p = .50 (intervals).

All participants (n = 4) who achieved final test scores above 95 points evidenced perfect scores on the rhythm sub-tests. In Group A, the average rhythm sub-score (M = 73, Mdn = 84) was higher than both the text (M = 69, Mdn = 79) and the interval sub-scores (M = 52, Mdn = 58). This trend also occurred in Group B, with an average rhythm sub-score (M = 80, Mdn = 90) that was higher than both the text (M = 76, Mdn = 89) and the interval sub-scores (M = 57, Mdn = 52). In both groups, the interval sub-scores were the lowest scores.

Research Question Two: Demographic Variables

The second research question inquired about potential differences in participant scores according to the demographic variables of sex, voice study, piano study, and level of post-secondary education. Table 3 presents participants' test scores and demographic data.

Table 3

Whole-Song Test Scores (Score Total) in Descending Order with Associated Sex, Post-Secondary Education (PSE), Voice Study (Voice Yrs), and Piano Study (Piano Yrs)

Sex	PSE	Voice Yrs	Piano Yrs	Score Total
F	Graduate	9	1	99
F	Graduate	10	8	97
F	Graduate	10	11	96
M	Graduate	17	15	96
F	Graduate	8	10	94

Table 3, continued

M	Graduate	10	5	94
F	Graduate	8	1	93
F	Undergraduate	4	9	91
M	Undergraduate	7	13	91
F	Undergraduate	3	11	90
M	Undergraduate	5	5	90
M	Graduate	7	2	89
F	Graduate	5	12	89
F	Graduate	8	3	87
M	Graduate	5	1.5	85
M	Undergraduate	3	2	84
M	Undergraduate	2	2	84
M	Graduate	11	4	84
F	Undergraduate	2	12	80
F	Graduate	11	2	79
F	Graduate	10	2	75
F	Graduate	11	2	71
F	Undergraduate	1	6	68
M	Graduate	14	3	67
F	Undergraduate	8	4	65
F	Undergraduate	2	3	62
F	Undergraduate	5	11	60
M	Graduate	8	3	55
F	Graduate	10	7	52
M	Undergraduate	6	11	51
F	Graduate	9	5	50
F	Undergraduate	7	2	49
F	Undergraduate	13	0	48
F	Graduate	8	2	44
F	Undergraduate	6	1	39

Table 3, continued

M	Graduate	8	3	38
F	Undergraduate	4	2	36
F	Undergraduate	5	5	36
F	Undergraduate	9	2	35
F	Undergraduate	6	2	23
M	Undergraduate	5	1	21
F	Undergraduate	4	1	9

Grouping the participants by sex yielded a group of 28 females and 14 males. The male group score (M = 73, Mdn = 84) was higher than the female group score (M = 65, Mdn = 66). However, a Mann-Whitney U (two-tailed) test showed no significant difference between the scores of the sex differentiated groups, z = -0.93, p = .35.

For post-secondary education according to undergraduate or graduate status, participants who had graduated from undergraduate school were grouped as if they were in graduate school. Grouping the participants by post-secondary education yielded 21 graduate students and 21 undergraduate students. The graduate student scores ranged from 38 to 99 (M = 78, Mdn = 85). The undergraduate student scores ranged from 9 to 91 (M = 58, Mdn = 60). The scores and ranges of the graduate student group were higher than those of the undergraduate student group. A Mann-Whitney U (two-tailed) test showed a significant difference between the scores of the graduate student group and the undergraduate student group, z = -2.69, p = .007.

Different participants had different experience levels shown through years of voice lessons. To create two groups to compare, the data were divided based on participants that reported 0 to 7 years of voice lessons (n = 21) and participants that

reported 8 to 17 years of voice lessons (n = 21). This division created two groups with the same number of participants. The 0 to 7 years of voice lessons group had scores ranging from 9 to 91 (M = 63, Mdn = 68). The 8 to 17 years of voice lessons group had scores ranging from 35 to 99 (M = 72, Mdn = 75). The differences in scores between these two groups was not significant, z = 1.26, p = .21.

Participants also reported years of piano study. Two groups were created based on years of piano study. The first group was based on 0 to 3 years of piano study (n = 23) and the second group was based on 4 to 15 years of piano study (n = 19). This division was selected because it provided the most similar number of participants in each group. The 0 to 3 years of piano study group scores ranged from 9 to 99 (M = 60, Mdn = 62). The 4 to 15 years of piano study group scores ranged from 36 to 97 (M = 77, Mdn = 89). A Mann-Whitney U (two-tailed) test showed a significant difference in scores between these two groups, z = 2.5, p = .012.

To explore the number of years of piano study in relation to post-secondary education, the participants were once again split into groups of graduate students and undergraduate students. The number of years of piano study for the group of graduate students ranged from 1 to 15 (M = 4.9, Mdn = 3). The number of years of piano study for the group of undergraduate students ranged from 0 to 13 (M = 5, Mdn = 3). A Mann-Whitney U (two-tailed) test showed no significant difference in the years of piano study between graduate students and undergraduate students, z = -0.16, p = .87.

Research Question Three: Reported Participant Memorization Techniques

Upon completion of the final whole-song singing test, participants responded in writing to the following prompt: "How do you typically approach memorization of a new piece of vocal literature? Please be as specific as possible."

These responses were categorized according to chronological priority, that is, by what participants mentioned first, second, and third. Table 4 presents these rankings.

Table 4

Participant Ranked Reports of Their Typical Memorization Sequences Involving Melody, Text, Rhythm, Combination of Methods (Comb), and Listening

Ranking:	Melody	Text	Rhythm	Comb	Listening	Total Participants
First	11	4	1	15	11	42
Second	5	12	2	9	2	30
Third	4	9	0	1	2	16
Total	20	25	3	25	15	NA

Note. Four participants specified a different memorization sequence for foreign languages.

"Melody" was categorized with pitch alone for this analysis instead of categorizing it with both pitch and rhythm because participants tended to specify "rhythm" as a separate idea from "melody." Rhythm was used as a category when participants specifically used the word "rhythm." Responses were included in the text category when participants used such words as "text", "words", and "diction."

Responses were included in the "combination of methods" when participants discussed combining any other methods. Descriptions of the "combination of methods" category included such phrases as "the song"; or singing text, rhythm, and pitches

together; or mentioning the repetition of various sized sections of the song. Participant responses were included in the listening category when they described listening to a recording.

Finally, a category of foreign language differentiation was used when participants mentioned that they would use a different method of memorizing a song in a foreign language than the typical method that they describe. This foreign language differentiation was not included in Table 4 because participants only described foreign language sequences in addition to, not alongside, English language sequences.

All participants ($N = 42$) listed a first-place item in their description of typical memorization sequences that fit one of the five categories. Only 30 participants listed both a chronologically first and second item. Sixteen participants listed three items chronologically, which was the maximum number of memorization sequence ranks reported.

Results Summary

In sum, results indicated no significant difference between final whole song memorization scores of participants who addressed text first and participants who addressed melody first. However, there were two significant differences according to demographic variables. Graduate students scored significantly higher than undergraduate students. Participants reporting four or more years of piano study scored significantly higher than participants reporting fewer than four years of piano study.

Participant comments indicated that melody and text were mentioned more frequently than any other factors in describing typical approaches to memorizing texted music. Participant comments indicated that a combination of methods was most

frequently mentioned as a first focus in a memorization practice sequence and that text was most frequently mentioned as the second focus in a memorization practice sequence.

Chapter 5

Discussion

Vocalists are often expected to memorize songs. From opera and musical theatre to rock bands and jazz singers, memorization is ubiquitous. Methods of memorization vary from source to source and from vocalist to vocalist. One method of memorizing songs is to separate the words and the melody during the initial period of memorization. Professionals have reported this sequencing as a preferred method (Ginsborg, 2004; Foley, 2007; Gregg, 2000).

The current study examined effects of two memorization sequences (text-melody and melody-text) on whole song memorization scores. Primary results indicate no significant difference in overall test scores according to memorization sequence. However, graduate students scored significantly higher than undergraduate students, and students with four or more years of piano study scored significantly better than students with fewer than four years of piano study.

These results are limited to the particular convenience population employed for this study, and likewise circumscribed by the particular procedures of this investigation. While findings should not be generalized, they do present several matters that warrant discussion and further research.

Memorization Sequence Effectiveness

Many experts recommend first memorizing text separate from the melody as opposed to memorizing both text and melody together from the beginning of the memorization process (Ginsborg, 2004: Foley, 2007; Gregg, 2000). Ginsborg (2004), for instance, found that those participants who began memorizing a song with text and

melody together performed the memorized song more accurately than participants who began memorizing a song with text and melody separately. She did not, however, report whether the text-melody or melody-text group in her study performed more accurately.

The participants in the current study show no significant difference in memorization accuracy between memorizing the song with a text-melody sequence or with a melody-text sequence. Professionals in the field of voice often recommend memorizing text before text and melody together. Data from this study do not seem to support this recommendation.

Indeed, one logical speculation, given results of this investigation, is that experience and years of piano study may assist song memorization regardless of memorization sequence. Future studies might explore this possibility.

Learning and Memorization

When professionals in the field of voice mention learning text separately, some clearly specify a memorization phase and some do not. Gregg (2000) states that, "…Understanding the poetry to be memorized would seem to be the logical place to begin" (p. 55). This statement clearly identifies a memorization phase. Ginsborg (2004) states that the professionals she interviewed, "…Reported learning the words and music of songs separately before combining them" (p. 150). She continues, saying, "Their memorization strategies were primarily for the words rather than the music" (p. 150). Ginsborg states that the professionals reported "learning" words and music separately, and then discusses their "memorization" strategies. It might be speculated that these professionals include their separation of text and melody in their initial study of the music, but not in their memorization phase.

Although they do not specifically address memorization time, Byo and Cassidy (2008) list many practice techniques that musicians implement during practice times. They report that musicians show inconsistencies in "knowing" and in "intelligent doing" when practicing. Two techniques listed that are also used in the current study are isolating a problem and memorizing the music. In the current study, memorization was the primary goal. Along with this goal, working with just the text or just the melody could be considered isolating a problem.

Future research could investigate a non-memorization practice phase and a deliberate memorization phase of learning songs. Text and melody could be separated in these different phases. Within these phases, multiple practice techniques could also be given as instructions. Participant efficiency could be documented to quantify "knowing" and "intelligent doing" while implementing various techniques.

Rest Periods

The current study alternated between periods of memorization and interactions with the author. These interactions would be periods away from active memorization. Duke (2006) investigated performance of a keyboard sequence with periods of 24 hours including sleep in between multiple retests. Cash (2009) investigated performance of a keyboard sequence with 5-minute periods of rest placed at different times between multiple short memorization periods. Both Duke (2006) and Cash (2009) found that rest periods improved memorized performances.

The current study included periods away from active memorization, but those periods were not designed to specifically be restful. Future research might explore memorizing a song with retests after longer periods of time, including periods of sleep.

Sub-Scores

Disaggregation of the sub-scores for participants in the present study shows no significant differences between Group A and Group B for rhythm, text, and interval. However, within each group, the rhythm sub-score is the highest score out of the three. In both groups, the lowest score out of the three is the interval score. However, the song used for this investigation contains difficult text and intervals.

The text was semantically meaningful and told a coherent story in English, but it was not a rhymed text. Wallace and Rubin (1988) found greater text recall when songs contained poetic elements such as assonance, alliteration, and rhyme than when poetic elements were removed. Future studies might explore the degree to which rhymes might serve as cues to recall text.

Interval sub-scores are the lowest among the three sub-scores calculated in the present study. The song featured two different variations of the same melody. Musical lines that matched between the first and second verse were altered so that the intervals were essentially through-composed. The two verses maintained a feel of the same chord structure and had similar phrasing. Such similarities may have contributed to many of the participants repeating intervallic lines from verse one in verse two. This repetition may have informed a lower interval sub-score. If the chord structure and phrasing were different between verses one and two of the song, different results may have occurred.

The rhythm sub-scores are the highest sub-scores. The rhythms of the song used are not difficult, because the rhythmic patterns match almost exactly in the two verses. This repetitive rhythmic feature could account for the high rhythm sub-scores. Wallace

and Rubin (1998), for example, found that participants exhibited greater text recall when reciting it in rhythm than with normal speech intonation.

Memorization Task Success

Typically, voice students are expected to memorize literature. The present study includes a practice session followed by a scored performance. In one sense, this scored performance is analogous to demonstrating successful memorization in a voice lesson. Given scores from the final memorization test, no participant in this study would have demonstrated complete mastery. Moreover, only four participants (9.52%) achieved scores between 95 and 99 points; eleven participants (26.19%) scored 90 points or above.

Unlike a test in history or science, however, memorization of a vocal score is basically an all or nothing proposition. Were the two highest scoring participants in this study performing "The Star Spangled Banner" with 3 - 10% incorrect intervals, for instance, even 100% mastery of text and rhythms likely would not compensate sufficiently for listeners to conclude that these singers had successfully performed the national anthem.

The song used in this study, of course, was not "The Star Spangled Banner." Aside from its unfamiliarity, its particular combination of intervals, text, and rhythms may have required more time to master than that allotted in this investigation. Future studies might allot more time or select a less lengthy or complex song. Subsequent studies could also measure participant success in memorization by presenting an even more complex song and charting success according to goals that students set for themselves, that is, in terms of what participants themselves deemed attainable in the time provided.

Sex and Years of Voice Lessons

Findings of this study indicated no significant differences in memorization success according to participant sex and years of voice lessons. Yet, 14 males and 28 females participated in this study. Future studies might employ more evenly distributed numbers of male and female participants.

It would seem logical that the more years of voice lessons that a singer takes, the better that singer would become at memorizing a song. Yet results of this study show no significant difference in memorization test scores according to years of voice study.

This finding raises two matters of interest. First, voice lessons teach a variety of skills, perhaps focusing most on efficient vocal production. Future studies might explore the amount of voice lesson time devoted specifically to acquiring memorization skills. Voice teachers, for instance, could be given a survey asking if and how often they address memorization techniques. Such a survey might also inquire about the specific memorization strategies recommended to students. Thereafter, students in those studios might be surveyed or even observed to determine how closely they adhered to teachers' recommended strategies.

Ross (1964) compared memorization scores achieved by instrumentalists who had been taught a guided analysis method to memorization to the memorization scores of those students who had not been taught this method. Results indicated that students who had experienced the guided analysis method scored significantly higher than those who had not been taught this method. Future researchers might replicate this study with vocalists.

Post-Secondary Education and Years of Piano Study

The finding that graduate students and students with four or more years of piano study in this study scored significantly higher on the memorization task than undergraduate students and students with fewer than four years of piano study raises two points of potential interest to researchers. First, might there be some relationship between post-secondary education and years of piano study? It would seem logical that students that have progressed on to graduate school have continued studying or playing piano. A future study might explore to what extents longevity in higher education and longevity in piano playing contribute to vocal memorization proficiency, or whether these factors are two sides of the same coin. Secondly, future research might be designed to inquire when the number of years of piano study ceases to be an apparently primary factor in score memorization proficiency. Similarly, it might be interesting to investigate whether piano study per se or piano study that equips students to accompany themselves while singing contributes more to score memorization skills.

Scoring

No standard method for scoring a song performance exists. Many researchers have evaluated sight-reading based on pitch or intervals. Boyle and Lucas (1990) and Lucas (1994) evaluate sight-singing with one point per pitch. They do not allow for modulation and do not account for rhythms. Cassidy (1993) and Killian (1991) evaluate sight-reading similarly by attributing one point per note, but they score based on intervals, which allows for modulation. They also do not account for rhythms. Scoring in the current study does account for modulation.

Some researchers break the performances into chunks to evaluate. Norris (2003) scores sight-reading with two points for each measure, one for correct rhythm and one for

correct pitch. Mito (2004) breaks the melody down into multiple measure blocks from which to judge. Ginsborg (2002) evaluates her participants based on counting the number of beats in the whole song and marking which beats are being rehearsed with different modes of attempt. Mito (2004) and Ginsborg (2004), moreover, evaluate texted songs and therefore account for text in their scoring.

Scoring in the current study evaluates each note for interval, rhythms, and text with an even weight for each. With one point for each note, scoring in the current study may yield a more precise score than chunking sections together.

All of the scoring methods mentioned, including the current study, rely upon human judgment for scoring. This approach is inevitably subjective. Future studies could explore a more objective evaluation method. For example, the use of software such as SmartMusic or VoceVista to verify pitches and rhythms might be pursued. Eventually, speech recognition or speech-to-text software may become sufficiently robust to use as an evaluation tool.

Reported Memorization Techniques

Ginsborg's (2002) study of singers memorizing a song counted modes of attempt when participants were observed memorizing. The most frequently observed mode of attempt in Ginsborg's study was "singing the words." Singing the words would be a combination of practicing the text, melody, and rhythm at the same time. Ginsborg's (2002) observed results align with the current study's most frequently stated category, "combination of methods."

The second most frequently used techniques in the first rank of memorizing a song are melody and listening. Listening to a recording of the song to be memorized

seems to be a good way to quickly get acquainted with the song. Some participants mentioned that they find multiple recordings to compare. Other participants described listening to their song repeatedly in the car whenever driving. Many of the participants who listed melody as their first rank in their sequence seemed to sing the melody along with a piano without the text before progressing on to their next step in their reported sequences.

The number of singers in this study who describe first looking at text appears low when compared to professional recommendations. The only technique that fewer participants listed as their first ranked technique was rhythm alone. Text was the only technique with increased frequency in the second and third ranks. It appears that when participants in the present study list two or more items in describing their typical song memorization sequences, they prefer to start by memorizing non-text elements and then move to text elements.

It may be appropriate in future studies to provide a forced rank survey item either in addition to or without the open-ended question used in this study. Future studies might also explore potential relationships between self-described methods of song memorization and actual song memorization behaviors.

High and Low Score Memorization Techniques

Participants in this study with the highest and lowest scores provide still other ideas for future research. In general, there appears to be no one pattern that distinguishes between the highest and lowest scoring participants. Rather, after considering participant scores and survey responses, these participants seem to approach memorization with a variety of sequences. For instance, one high scoring participant reports typically

beginning memorization by focusing on the melody, while another high scoring participant reports focusing first on a combination of factors. Likewise, one low scoring participant reports beginning with the melody, while another low scoring participant says he typically starts with the text.

It may be, however, particularly in light of the significant differences found according to level of schooling and years of piano study, that whether one begins a memorization sequence with one focus or another focus is not nearly as important as experience and other demographic factors. Future studies might well proceed with an assumption that factors other than sequence of memorization strategies may be at play.

This study is one of a very few empirical studies to date to examine song memorization sequences and strategies. It provides some replicable procedures and scoring techniques that may be of interest to future researchers. Overall, its findings suggest that memorization of vocal scores may be a complex and idiosyncratic process, and therefore continued research appears warranted.

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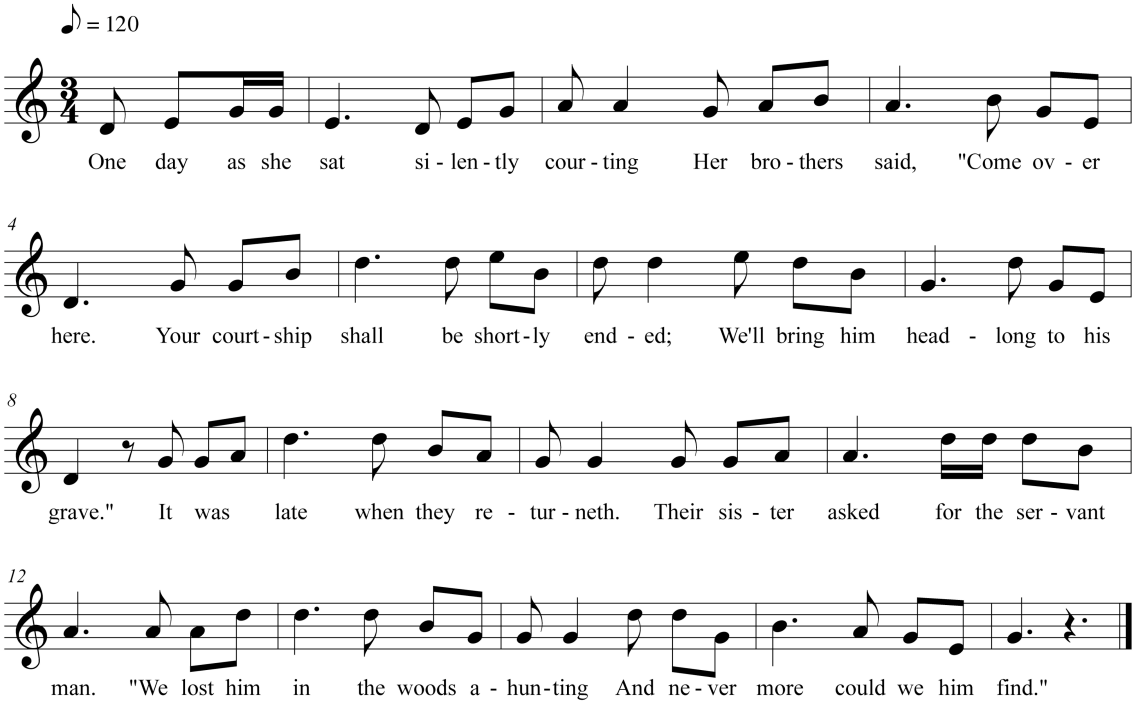
Appendix A

Song Score

Ballad

Melody and Lyrics



Appendix B

Song Text

One day as she sat silently courting

Her brothers said, "Come over here.

Your courtship shall be shortly ended;

We'll bring him headlong to his grave."

It was late when they returneth.

Their sister asked for the servant man.

“We lost him in the woods a-hunting

And never more could we him find.”

Appendix C

Demographic Survey

Name: _____ Participant Number: _____

Age: _____ Sex: _____ Year In School: _____

Undergraduate or Graduate: _____ Major: _____

Years of Voice Lessons: _____ Years of Piano Study: _____

How would you rate your skills in memorizing a song with both music and text? (circle one)

Very Poor Poor Average Good Very Good

Please rate your familiarity with the following song titles. (circle one for each title)

"The Bramble Brier"

Not at all familiar Somewhat familiar Moderately familiar Very familiar Previously Memorized

"The Lass of Roch Royal"

Not at all familiar Somewhat familiar Moderately familiar Very familiar Previously Memorized

"Lord Batesman"

Not at all familiar Somewhat familiar Moderately familiar Very familiar Previously Memorized

"Lord Thomas and Fair Annet"

Not at all familiar Somewhat familiar Moderately familiar Very familiar Previously Memorized

"Scarboro Sand"

Not at all familiar Somewhat familiar Moderately familiar Very familiar Previously Memorized

Participant Number: _____

How do you typically approach memorization of a new piece of vocal literature? Please be as specific as possible.

Appendix D

Experiment Script

Group A (Text then Melody)

Survey and Consent Form on door.

Introduction (35 seconds):

"Please read the consent form found in the top folder on the door and sign the final page."

(Collect the consent form.)

"For this study, you will be memorizing a song over four periods of time. Instructions for each period will be given to you before that period. You will be asked to perform the memorized material after each period. You will be wearing this headset microphone. Please put it on now. I will adjust the microphone location."

"There was a two page survey in the bottom folder on the door. Please complete that survey by the end of the study and give it to the investigator. Do you have any questions?"

Presentation of the whole song (1 minute, 15 seconds):

"You will now hear the whole song one time through. Please follow along with this sheet music."

(Give the participant the sheet music and play the recording.)

Presentation of the Text (4 minutes, 35 seconds):

"You now have four and a half minutes to memorize the text on this page word-for-word to the best of your abilities. Feel free to utilize the text sheet and a pencil. I will return at the end of this period."

(Start the time and leave the room.)

Performance #1 (~1 minute, 30 seconds)

"I will be recording you now. When I say begin, please recite what text you can remember with as few pauses as possible. Let me know when you are finished. Any questions?"

"Begin."

Presentation of the Rhythmic Text (4 minutes, 35 seconds):

"You now have four and a half minutes to memorize the text with rhythms on this page to the best of your abilities. Feel free to utilize the rhythmic text sheet and a pencil. I will return at the end of this period."

(Start the time and leave the room.)

Performance #2 (~1 minute, 30 seconds)

"When I say begin, please recite what rhythmic text you can remember with as few pauses as possible. Let me know when you are finished. Any questions?"

"Begin."

Presentation of the Melody (9 minutes, 30 seconds):

"You now have nine minutes to memorize the melody on this page to the best of your abilities including pitches and rhythms. Please use a neutral vowel of your choice. Feel free to utilize the sheet music, a pencil, this keyboard, and this MIDI audio file on this iPod. Do you know how to use an iPod? (If not, give the participant a brief tutorial of the basic functions.) I will return at the end of this period. Do you have any questions?"

(Start the time and leave the room.)

Performance #3 (~1 minute, 30 seconds)

"I will give you your starting pitch. When I say begin, please sing the melody including pitches and rhythms with as few pauses as possible using any neutral vowel. Let me know when you are finished. Any questions?"

(Play a D.)

"Begin."

Presentation of the Whole Song (3 minutes, 30 seconds):

"You now have 3 minutes to memorize the whole song with the text and the melody on this page to the best of your abilities. Feel free to utilize the sheet music, a pencil, this keyboard, and this MIDI audio file on this iPod. I will return at the end of this period."

(Start the time and leave the room.)

Performance #4 (~1 minute, 30 seconds)

"I will give you your starting pitch. When I say begin, please sing the song including text and melody with as few pauses as possible. Let me know when you are finished. Any questions?"

(Play a D.)

"Begin."

Closing

"Thank you for participating. Please take some candy at the door."

(Ensure that the survey form is complete.)

Group B (Melody then Text)

Survey and Consent Form on door.

Introduction (35 seconds):

"Please read the consent form found in the top folder on the door and sign the final page."

(Collect the consent form.)

"For this study, you will be memorizing a song over four periods of time. Instructions for each period will be given to you before that period. You will be asked to perform the memorized material after each period. You will be wearing this headset microphone. Please put it on now. I will adjust the microphone location."

"There was a two page survey in the bottom folder on the door. Please complete that survey by the end of the study and give it to the investigator. Do you have any questions?"

Presentation of the whole song (1 minute, 15 seconds):

"You will now hear the whole song one time through. Please follow along with this sheet music."

(Give the participant the sheet music and play the recording)

Presentation of the Melody (9 minutes, 30 seconds):

"You now have nine minutes to memorize the melody on this page to the best of your abilities including pitches and rhythms. Please use a neutral vowel of your choice. Feel free to utilize the sheet music, a pencil, this keyboard, and this MIDI audio file on this iPod. Do you know how to use an iPod? (If not, give the participant a brief tutorial of the basic functions.) I will return at the end of this period. Do you have any questions?"

(Start the time and leave the room.)

Performance #1 (~1 minute, 30 seconds)

"I will be recording you now and will give you a starting pitch. When I say begin, please sing the melody including pitches and rhythms with as few pauses as possible using any neutral vowel. Let me know when you are finished. Any questions?"

(Play a D.)

"Begin."

Presentation of the Text (4 minutes, 35 seconds):

"You now have four and a half minutes to memorize the text on this page word-for-word to the best of your abilities. Feel free to utilize the text sheet and a pencil. I will return at the end of this period."

(Start the time and leave the room.)

Performance #2 (~1 minute, 30 seconds)

"When I say begin, please recite what text you can remember with as few pauses as possible. Let me know when you are finished. Any questions?"

"Begin."

Presentation of the Rhythmic Text (4 minutes, 35 seconds):

"You now have four and a half minutes to memorize the text with rhythms on this page to the best of your abilities. Feel free to utilize the rhythmic text sheet and a pencil. I will return at the end of this period."

(Start the time and leave the room.)

Performance #3 (~1 minute, 30 seconds)

"When I say begin, please recite what rhythmic text you can remember with as few pauses as possible. Let me know when you are finished. Any questions?"

"Begin."

Presentation of the Whole Song (3 minutes, 30 seconds):

"You now have 3 minutes to memorize the whole song with the text and the melody on this page to the best of your abilities. Feel free to utilize the sheet music, a pencil, this keyboard, and this MIDI audio file on this iPod. I will return at the end of this period."

(Start the time and leave the room.)

Performance #4 (~1 minute, 30 seconds)

"I will give you your starting pitch. When I say begin, please sing the song including text and melody with as few pauses as possible. Let me know when you are finished. Any questions?"

(Play a D.)

"Begin."

Closing

"Thank you for participating. Please take some candy at the door."

(Ensure that the survey form is complete.)

Appendix E

HSLC Letter

KU RESEARCH & GRADUATE STUDIES
The University of Kansas

5/2/2012

HSCL #20136

Bradley Wilson
4501 Wimbledon Drive, Apt. E3
Lawrence, KS 66044

The Human Subjects Committee Lawrence reviewed your research application for project

20136 Wilson/Daugherty (MUSIC) Effect of Two Practice Scenarios on Song Memorization Accuracy

and approved this project under the expedited procedure provided in 45 CFR 46.110 (f) (7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies. As described, the project complies with all the requirements and policies established by the University for protection of human subjects in research. Unless renewed, approval lapses one year after approval date.

The Office for Human Research Protections requires that your consent form must include the note of HSCL approval and expiration date, which has been entered on the consent form sent back to you with this approval.

1. At designated intervals until the project is completed, a Project Status Report must be returned to the HSCL office.
2. Any significant change in the experimental procedure as described should be reviewed by this Committee prior to altering the project.
3. Notify HSCL about any new investigators not named in original application. Note that new investigators must take the online tutorial at http://www.rcr.ku.edu/hscl/hsp_tutorial/000.shtml.
4. Any injury to a subject because of the research procedure must be reported to the Committee immediately.
5. When signed consent documents are required, the primary investigator must retain the signed consent documents for at least three years past completion of the research activity. If you use a signed consent form, provide a copy of the consent form to subjects at the time of consent.
6. If this is a funded project, keep a copy of this approval letter with your proposal/grant file.

Please inform HSCL when this project is terminated. You must also provide HSCL with an annual status report to maintain HSCL approval. Unless renewed, approval lapses one year after approval date. If your project receives funding which requests an annual update approval, you must request this from HSCL one month prior to the annual update. Thanks for your cooperation. If you have any questions, please contact me.

Sincerely,

Stephanie Dyson Elms
HSCL Coordinator
University of Kansas

cc: James Daugherty

Human Subjects Committee Lawrence
Youngberg Hall I 2385 Irving Hill Road I Lawrence, KS 66045 I (785) 864-7429 I HSCL@ku.edu I www.rcr.ku.edu/hscl